

STATUS OF M-C POWER'S MCFC PROGRAM

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Molten Carbonate Fuel Cell (MCFC) power plants employing the IMHEX7 stack design will be commercialized by M-C Power Corporation of Burr Ridge, Illinois during the first few years of the new millennium. The high electrical efficiency and low emissions of the MCFC power plant will revolutionize the power generation industry during the 21st century. This presentation will summarize the key accomplishments achieved in the past year by the commercialization team, including recent full-area stack test results, commercial manufacturing improvements, and the BOP equipment status. A commercialization schedule with future plans will be presented.

M-C Power is nearing the full commercialization of its MCFC power generation technology. Within the last year, M-C Power has delivered two stack modules: the first was utilized for an extended PAC test of the BOP, while the second stack is currently operating in the fully integrated power plant at the Marine Corps Air Station (MCAS) in Miramar, California. The primary objectives of this test are to evaluate a commercial cell package and improved balance of plant components, including the hot gas recycle blower and turbo-charger, as well as to test demonstration plant systems conditions and operating parameters. To date (7/23/99), the stack has generated 32 MWH power with an average output of 77 kW since being brought on line July 4, 1999.

Concurrently, M-C Power has an aggressive manufacturing development and engineering program in place to identify, optimize, and institute advanced component and balance of plant (BOP) technologies that provide improved plant performance and endurance characteristics while decreasing costs. Cost reductions have been demonstrated through concurrent raw material cost reductions, elimination of manufacturing processes, and weight reduction of stack and plant components. While significant cost reductions and manufacturing improvements have already been realized, the challenge remains to further reduce costs while demonstrating increased stack performance and endurance.

Manufacturing improvements implemented within the last year have targeted increasing the existing plant capacity to 10 MW/year. Plant upgrades include installation of an automated mixing system and improved drying systems enabling tape caster belt increases of 2X, exceeding commercial targets. The manufacturing processes of the market entry stack components have been scaled up in commercial manufacturing mode. Manufacturing process and layout simulations are in process to generate improved plant designs for the future manufacturing facility with increased capacity.

BOP equipment reliability is currently being demonstrated through extensive testing in the BOP Test Facility. Within the last year, Elliot turbogenerator modules completed the short term testing phase of 500 hours of continuous operation and further testing will be completed with the beta-unit projected for 3rd quarter of 1999. Other testing completed involved evaluating different hot gas recycle blower seal designs and verifying the endurance of a low cost Heat Recovery Steam Generator (HRSG).

Demonstration plant designs have been completed for high efficiency by implementing the following design improvements: thermal integration, increased power densities, and co-generation. In addition, the demonstration BOP operations have been simplified by minimizing controls, implementing proven operating procedures, simplifying the startup/shutdown operations and integrating functions.

Future plans include the manufacture and delivery of 200 kW stack to operate at MCAS after the 75 kW stack. The construction of four prototype commercial units will begin in the year 2000.